# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

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Ms. Kelly White
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Office of Pesticide Programs
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1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460-001

Dear Ms. White:

The U.S. Fish and Wildlife Service appreciates the opportunity to submit comments to the U.S. Environmental Protection Agency (EPA) regarding the document "Potential Risks of Nine Rodenticides to Birds and Nontarget Mammals: A Comparative Approach" (EPA DOCKET CONTROL NUMBER OPP-2004-0033). The following comments are related to the general effects of rodenticides to birds and nontarget mammals based upon information included in the comparative risk assessment and are not meant to specifically address effects to endangered species, which EPA and the Service will focus on in future interactions.

## BACKGROUND

In the reregistration of pesticides, EPA occasionally performs simultaneous risk analyses on compounds that share similarities such as a common active ingredient or mode of action. In the case of the currently registered rodenticides, EPA compares nine chemicals that share common target pest species for their risk to nontarget birds and mammals. This comparative assessment differs from typical ecological risk assessments produced in support of chemical reregistration. Typically, ecological risk is evaluated through the use of risk quotients, in which exposure and toxicity information can trigger potential risk to nontarget taxa when predetermined "levels of concern" are surpassed. In this comparative assessment, no absolute triggers are employed to indicate potential risk; rather each compound is ranked as to its risk to nontarget birds and mammals relative to one another. Conclusions for overall risk, primary risk from direct exposure, and secondary risk from predation and scavenging, are based on these rankings as well as lines of evidence drawn from other available data, including incident reports.

The nine rodenticides included in this comparative risk assessment are three second-generation anticoagulants (brodifacoum, difethialone, bromadiolone), three first-generation anticoagulants (diphacinone, chlorophacinone, warfarin), and three non-anticoagulant pesticides with disparate modes of action (zinc phosphide, cholecalciferol, bromethalin). These rodenticides are mainly used to control commensal rats and mice in and around buildings and sewers, are non-selective, and may cause effects in nontarget

species similar to those for target species. Anticoagulant poisons interfere with the action of vitamin K in the production of clotting factors in the liver, and induce capillary damage and hemorrhaging. So-called "first generation" compounds are rapidly metabolized and must be ingested for several days to provide a lethal dose, while "second-generation" anticoagulants have greater retention in the body and therefore are more acutely toxic. Second-generation anticoagulants generally deliver a lethal dose in a single feeding, though death is typically delayed 5 to 10 days during which time the animal may continue to feed on bait. Bromethalin (a neurotoxin), zinc phosphide (liberates toxic phosphine gas in the stomach), and cholecalciferol (stimulates the mobilization of calcium to cause hypercalcemia) can provide a lethal dose in a single feeding and are less likely to be retained in body tissues. However, less data are available to assess the effects of these rodenticides than are available for the other rodenticides considered herein.

The current document under review is EPA's third iteration of a comparative risk assessment for rodenticides. Concern for potential adverse effects to birds and nontarget mammals expressed in the 1998 rodenticide cluster and zinc phosphide Reregistration Eligibility Decisions (REDs) led to EPA's announcement the following year that a comparative approach would be used to assess this ecological risk. In November 2000, a draft assessment was released ("Comparative Risks of Nine Rodenticides to Birds and Non-target Mammals") and in December 2002 a preliminary version of the current document. Changes that appeared in the 2002 document were the result of an external peer review conducted by scientists outside of the agency and input of registrants.

## COMMENTS

Based on review of EPA's comparative risk assessment, published literature, and wildlife mortality reports, it is the opinion of the Service that continued use of rodenticides under current conditions presents a significant level of risk to birds and nontarget mammals. Further, the ever-increasing number of mortality events attributed to second-generation rodenticides indicates that current restrictions placed on these pesticides (baiting of commensal rodents in and around buildings, transport vehicles, and inside sewers, and indoor use only for brodifacoum and difethialone in non-urban areas) is insufficient to prevent exposure to nontarget organisms at levels consistent with adverse effects.

**Secondary Exposure to Anticoagulants**. Of the second-generation rodenticides, EPA's analysis finds brodifacoum to have the greatest risk to nontarget organisms, based primarily upon its high secondary toxicity in laboratory studies and protracted retention time in tissue (half-life in liver >200 days). In addition, it was detected in 240 of the 342 (70%) rodenticide-related mortality incidents in EPA's Ecological Incident Information System (EIIS) at the time of publication of the risk assessment. Secondary exposure to brodifacoum has been implicated in mortality events involving the following: several species of owls, hawks, and vultures; bald and golden eagles; corvids, coyotes, bobcats, and mountain lions; raccoons, the long-tailed weasel, striped skunk, opossum, red and

gray foxes; and the Federally endangered San Joaquin kit fox (26 documented kit fox mortalities between 1999 and 2002). Though restricted to use in or around buildings, this pesticide clearly finds its way into the natural food chain. The probable cause most likely combines the movement of rodents to areas outside buildings between the time of brodifacoum ingestion and death, preferential selection of anticoagulant-incapacitated prey by predators, and illegal misuse of the rodenticide. Though the amount of pesticide delivered in an exposed rodent through secondary exposure can vary from a nontoxic to a lethal dose, the physiological persistence of this pesticide allows accumulation from multiple nontoxic doses to reach a lethal dose.

The second-generation rodenticides bromadiolone and difethialone also pose significant risk to birds and nontarget mammals. Though less acutely toxic than brodifacoum, bromadiolone is believed to persist in tissue for comparable periods and has been detected in 39 mortality incidents involving species similar to those detected with brodifacoum residues. Much less is known regarding the toxicity and bodily retention of [redacted], a relatively new rodenticide, and no data exist for secondary toxicity. However, its [redacted] and properties and available acute toxicity and retention data make difethialone likely to pose comparable risks. Though both bromadiolone and difethialone were detected in a much lower number of mortality incidents involving birds and nontarget mammals, relative use may account for a portion of this disparity. Brodifacoum is believed to account for the vast majority of over-the-counter sales, though the attainment of detailed use statistics for all rodenticides would enhance the ability to conclusively interpret these data. Regardless, it is reasonable to conclude that any shift in use patterns that would cause an increase in either bromadiolone or difethialone would result in an increase in their detection in nontarget organisms.

The first-generation anticoagulants chlorophacinone, diphacinone, and warfarin also present a risk to nontarget organisms, though a higher dose is required to produce adverse effects. Despite the general or state-specific legality of their use in fields, orchards, parks and woodlands, in addition to commensal rodent use, first generation anticoagulants have been detected in fewer nontarget organisms involved in mortality incidents that were likely resultant from secondary exposure (six for chlorophacinone, twelve for diphacinone, and three for warfarin). Currently, anticoagulants used in field situations must be applied by a certified applicator.

**Primary Exposure to Anticoagulants**. For certain rodenticides, ingestion of a single pellet or bait can cause mortality in nontarget organisms. While most rodenticides are formulated to provide lethal concentrations to mammals in small doses, avian mortality can also occur from exposure to a single pellet of brodifacoum, difethialone, or zinc phosphide. Bromethalin also exhibits high acute toxicity to birds, with lethal levels achieved after ingestion of approximately six pellets. Brodifacoum, bromadiolone, chlorophacinone, diphacinone, warfarin, and zinc phosphide have all been detected in

association with mortality incidents involving primary consumers (doves, geese, turkey, white-tailed deer, chipmunk, squirrels, rabbits, kangaroo rat).

**Nontarget Exposure to Anticoagulants**. Widespread nontarget exposure to anticoagulants cannot be disputed. Based on a study of carcasses collected from 1998-2001 in New York State, including samples asymptomatic of anticoagulant exposure submitted for West Nile Virus surveillance, Ward Stone, Wildlife Pathologist for New York State Department of Environmental Conservation, concluded that anticoagulants were present in the majority of great horned owls, about half of the red-tailed hawks, and in a substantial fraction of other raptors in New York State (Stone et al., 2003)[1]. Detection of more than one rodenticide in a number of these carcasses indicates that a percentage of these birds are acquiring these residues through multiple exposures. For smaller species, the picture is less clear. Most incident reports tend to focus on large conspicuous species like predators and scavengers. For incidents involving brodifacoum, two-thirds of all avian mortalities reported in EIIS were for great horned owls, golden eagles, and red-tailed hawks, birds which are amongst the largest of even predatory species. Incident reports are believed to represent a small fraction of the actual mortality for any given pesticide (Vyas 1999)[2]. In order to document a pesticide-related mortality, a carcass must be observed, reported, collected, and chemically analyzed while still relatively fresh. Carcass-detection studies have found that even when searches are performed on known carcasses, a significant percentage will never be found due to scavenging, location in remote, inaccessible areas, or size or coloration that renders the carcass inconspicuous (Vyas 1999). Since both toxicity and incident data are lacking on small birds such as passerines, exposure via direct ingestion of bait or secondary exposure through invertebrate prey species and its effects to these species can only be speculated.

## RECOMMENDATIONS

Due to their high nonselective toxicity and known involvement in the mortality of birds and nontarget mammals, the Service recommends the following mitigative measures to alleviate risk to nontarget organisms:

**All rodenticides considered in this assessment should be restricted to use by a certified applicator.** The prevalence of rodenticides in wild birds and mammals indicates that current restrictions are not sufficient to hinder their spread to nontarget organisms. Incident reports represent only a fraction of the total exposure to nontarget species, and monitoring studies have only begun to give an indication of how widespread this exposure is. A portion of this exposure can likely be attributed to misuse in outdoor settings, an exposure route which must be considered as part of the normal use pattern.

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[1] Stone, WB, JC Okoniewski, and JR Stedelin. 2003. Anticoagulant rodenticides and raptors: recent findings from New York, 1998-2001. Bulletin of Environmental Contamination and Toxicology 70:34-40.
[2] Vyas NB. 1999. Factors influencing estimation of pesticide-related wildlife mortality. Toxicology and Industrial Health 15:186-191.

Restriction to use by certified applicators would help reduce this route of exposure by reserving pesticide application to trained individuals knowledgeable of the use restrictions required by law. Though brodifacoum currently accounts for the greatest risk to nontarget species, the highest number of incidents, and the vast majority of the over-the-counter market, restriction of any single chemical or chemical group could create a situation in which a sudden increased use in another pesticide may result in similar or unforeseen consequences.

**Second-generation rodenticides should be limited to use inside buildings only, except in situations where the benefits to nontarget organisms outweigh the risks**. Second-generation rodenticides have proven to be a greater threat to nontarget wildlife due to their high toxicity and ability to bioaccumulate in tissue. Though currently restricted to areas around buildings, this limitation on its use has not proven sufficient to prevent the spread into the food chain. Though brodifacoum has been associated with the greatest risk to secondary consumers, difethialone and bromadiolone can also present significant harm to wildlife, and any increase in their use would likely correlate with an increase in wildlife exposure.

Second-generation rodenticides have been used successfully to promote species conservation in situations such as rodent eradication on islands. Use of rodenticides in these scenarios has involved intricate and careful planning between government agencies and conservation organizations and has incorporated post-application monitoring. The Service supports continued use of rodenticides for these purposes.

**To reduce risk associated with primary exposure, all rodenticides considered in this assessment should be made inaccessible to nontarget organisms by mandating the use of tamper-proof bait stations**. Due to potential lethality associated with direct exposure to rodenticide bait, stations designed to be accessible only to target organisms should be employed in any baiting situation. This approach would reduce the potential for exposure of nontarget birds or mammals.

Because nontarget exposure likely results from a combination of rodent migration before death, preferential selection of exposed prey by predators, and misuse of rodenticides by consumers, it is recommended that all of these mitigation measures be placed into effect to reduce risk to nontarget species. Rodenticide use under current regulations has resulted in wildlife exposure and mortality that may be in violation of the Endangered Species Act, the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. Adoption of the above-mentioned measures would significantly minimize the effects of these rodenticides on listed and other nontarget species.

Thank you for the opportunity to comment on the comparative risk assessment regarding rodenticides. The Service commends the comprehensive assessment of ecological effects and identification of potential harm in this risk characterization and asks EPA to follow through on this effort by providing appropriate protection to nontarget organisms in its

regulation of these pesticides. We look forward to extensive interaction with EPA in the assessment of effects to endangered species from rodenticide use. If you have any questions or require additional information, please contact Nancy Golden, Division of Environmental Quality, at (703) 358-2148.

Sincerely,

Everett Wilson

Everett Wilson, Chief
Division of Environmental Quality

Copy to: Dr. Debra Edwards
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